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ABSTRACTS.

University Geological Survey of Kansas. By ERASMUS HAWORTH AND ASSISTANTS. (Vol. I, 320 pp., pl. XLI. Topeka, 1896.)

This report covers the whole of the Carboniferous of the state and includes notes on various detailed sections across the area, studies of the stratigraphy and lists of characteristic fossils. Economic geologists will be especially interested in chapters XI and XII, relating to the coal and oil and gas fields. In all some twenty counties have produced more or less coal and the output for 1894 was valued at \$4,889,774.62. Nearly 90 per cent. of this was won from the Cherokee shales, the basal portion of the Coal Measures. Near the middle of these shales is the heaviest vein occurring in the state. It is known as the Weir City-Pittsburg coal. It outcrops to the southeast and dips northwest at a rate of about 17 feet per mile. It is remarkably uniform in thickness, averaging 40 inches with an occasional maximum of four feet or more. Thinner veins occur both in the Cherokee and other shale beds. The heating power of a number of Kansas coals as determined by Professor Blake of the State University ranges from 9.90 pounds of water evaporated per pound of coal, to 14.43; most of the coals evaporating from 12 to 13 pounds. In volatile matter Professor Bailey, also of the University, finds a range of from 35.32 to 46.14. The water ranges from 1.31 to 13.70 with the larger number of analyses below 7 per cent. The fixed carbon runs from 28.52 to 54.17 and the ash from 7.46 to 13.96.

Dr. Haworth thinks there are good reasons for believing that coal mining in Kansas will increase with comparative rapidity during coming years, and that the amount of coal present has been very greatly underestimated.

Gas and oil have been suspected to occur in the state since its first settlement, and from time to time wells of more or less volume have been opened up, till in 1890 a dozen towns and cities were principally or wholly supplied with light and fuel from these sources. The major development of the field has been in the last six years and has been brought about largely by the systematic prospecting carried on by the large eastern companies. At present gas is used wholly or partially in

Wyandotte, Paola, Ossawatomie, Fulton, Iola, Humboldt, Cherryville, Neodesha, Independence and Coffeyville, and has been obtained in more limited quantities at Fort Scott, Girard, Pittsburg and elsewhere. Oil is obtained in considerable quantities at Peru, Neodesha, Thayer, Independence, Ossawatomie and elsewhere. Quite flattering results were being obtained by prospectors in the early months of the present year when the report went to press. The field, as now outlined, includes 8500 square miles and is approximately bounded as follows: From Kansas City draw a line to Lawrence and from the latter point continue it through to Sedan in Chautauqua county. With the exception of about 500 square miles in the southeast, the area included is all within the field; not a single county within these limits having failed to produce oil or gas or both. Nine-tenths of the flow has come from the sandstones found in the Cherokee shales, though each of the shale beds from the Mississippian to the Lane shales has proven more or less productive. The flows are not exceptionally heavy, though there are strong wells at Neodesha and the Palmer well at Iola yields seven million cubic feet of gas per day. But few paying wells are known which are more than 900 feet deep and many good wells are less than 600. The details of the anticlinals and synclinals present in the field are too imperfectly known to allow any general conclusions as to their influence to be drawn. The Paola well is in one of the greatest synclinals present in the state. In general, structure seems to have had but slight influence upon the collection of the gas, texture being far more potent. The gas and oil are of organic and probably vegetable origin. They are derived from the bituminous shales and collected in the more porous intercalated sand beds. Probably this accounts for the fact that they are more uniformly disseminated in the Kansas field than in any other yet developed in America. Dr. Haworth thinks there is good reason for hoping that the oil and gas industry of the state will ultimately assume considerable proportions even compared with the same industry in the eastern states.

H. F. B.

Till frågan om lommalerans ålder (Concerning the Age of the Lomma clay). Af GERARD DE GEER. Sveriges geologiska undersökning, Afhandlingar och uppsatser, no. 155; Stockholm, 1895.

The author replies to the arguments put forth by Holst and Moberg against evidence for interglacial deposits in Sweden. He calls atten-

tion to the fact that he has not regarded the reference of the Lomma clay to the interglacial river clay (hvitålera) as being certain and beyond dispute. While his reserve in this respect has been correctly stated by other authors, it has not been indicated by Holst and Moberg. As to the argument made by these gentlemen that a later glacier would have left a heavier moraine resting on the Lomma clay, it is urged that no such moraines have been left by the ice in a great many other places, where the bed-rock is now in view, nor are such moraines now found over extensive areas in Germany and Denmark, where they are known to have been removed by erosion. The undisturbed bedding of the Lomma clay does not preclude the possibility of later glaciers overriding it, for underlying soft beds are not always disturbed under such conditions. As to the fossils which have been found in this clay (*gadus polaris*, *coscinodiscus*, and a number of foraminifera) the author shows that there is reason to believe that the foraminifera have been washed out from the subjacent moraine, and hence may belong to an earlier period. Hence these fossils do not indicate anything with certainty as to the climate obtaining when the clay was deposited. The age of the Lomma clay must still be left an open question. The author does not regard this circumstance as having any important bearing on the hypothesis of a multiple glacial age as applied to Swedish territory. He inclines to the view that the Lomma clay and the Yoldia clay both belong to a horizon between the drift of the earlier glaciation and the drift of the Baltic ice-sheet, but he leaves the question unsettled as to the climatic conditions indicated by biotic evidence. To distinguish such undetermined deposits as these from other beds which are with certainty known to be interglacial, the author applies to the former the name *intraglacial*.

J. A. U.

Om strandliniens förskjutning vid våra insjöar. (On the Displacement of the Shoreline of our Inland Lakes.) By GERARD DE GEER, Sveriges geologiska undersökning, Afhandlingar och uppsatser; no. 141, pp. 15.

As regards the displacement of the shoreline, the author divides the lakes of the glaciated country about the Baltic Sea into two classes: one including such lakes as have their outlets in the direction of least elevation, and the other including such as have their outlets in the direction of greatest elevation. Nearly all of the lakes in the high-

land of Småland belong to the former class and attention is called to the fact that extensive deposits of clays and marls occur skirting the north shores of these lakes. This indicates that the basins have been tilted to the south. The old lake bottoms have been raised above the water, on the north, and the lakes have been partially emptied. Deposits of sand, now covered by peat, north of the lakes Bolmen and Vidöstern indicate that these lakes have been reduced to about one-half of their original size by this process. It is believed that these lakes lie outside of the latest glacial limits, and the calcareous nature of the clays indicates that these are sediments brought down by glacial streams. The deltas of Klarelfven and Glommen, running into the raised ends of lakes Venern and Öieren, rise above the present level of the water in these lakes. The tilting of Lake Venern from north to south is believed to have been about 13^m.

Among the lakes which have been tilted away from their outlets, Stora Le and Vettern are mentioned. Stora Le is about fifty times as long as it is wide and its axis lies in the direction of the gradient of the differential elevation of the region. It appears that since the time this lake was separated from the sea by the barrier over which its outlet now runs, the north end of its basin has been elevated 101^m, while the south end has been raised only 92^m. Marked cliffs of erosion, submerged deltas, and lagoons indicate a relative sinking of the south end of the basin. It is likely that the displacement of the water level at this place amounts to 9^m. From like evidence it appears that the surface of the water in the south end of Lake Vettern has risen 10^m since the time this lake was united with the sea.

The last part of the paper touches on the evidences of displacement of the basin of the Ancylus Lake, a great body of fresh water which at one time occupied the basin of the Baltic Sea. The presence of arctic land plants in deposits on the shores of Kattegat renders it probable that this channel was closed at the time an arctic climate yet prevailed. The outlet of the Ancylus lake at that time was most likely over the depressions near Karlsberg or Örebro, north of Lake Vettern. In the south part of the Baltic basin submarine peat bogs show that part of this country has at one time had an elevation of 30^m above its present altitude. By a lifting of the north end of the Ancylus basin, the water was displaced to the south, until it made its escape through Öresund. When this lake reached its widest extent, it probably covered an area of 570,000^{km}, exceeding in size all known

bodies of fresh water. Our present knowledge of the changes in level in the Baltic region is very incomplete, and the author urges the importance of more observations bearing on the subject. He is of the opinion that a close study of the changes in the shorelines of many other lakes will give important results in this direction. J. A. U.

The Search for the North Pole. By EVELYN BRIGGS BALDWIN. Published by the author, Chicago, Ill.

The author was meteorologist to the second Peary expedition and spent the year 1893-4 in northern Greenland. The severe conditions that limited the success of that expedition did not quench Mr. Baldwin's ardor for Arctic work, and this book has been prepared as an expression of that interest and as an aid to the necessary means for further enterprises. Its purpose is to awaken a wider interest in northern exploration, to remove erroneous impressions popularly entertained respecting it, and, if haply it may so be, to evoke aid for its continued prosecution.

The attempt of the book is to give a summary history of all Arctic expeditions. It is not confined to those whose chief object was to reach the pole. In this respect the book is broader than its title. The selection of matter has been made with a view to popular interest, and it is to be judged on that basis. It makes no pretension to a discussion of the scientific problems of the north, although matters of scientific interest are woven into the narrative so far as thought consistent with its popular interest. In the choice of extracts from the various narratives there has been only a limited yielding to the allurements of florid coloration, exaggerated heroism and morbid sensationalism which characterize so much of Arctic literature. It is a plain, straightforward, very readable story of a series of remarkable enterprises. It is probably the most complete compilation, within like limits, that has yet been made. T. C. C.

Iowa Geological Survey, Vol. V, Annual Report, 1895, 452 pp., 14 plates, 7 maps. Des Moines, 1896.

In the report upon Jones county Professor Calvin divides the Niagara series into the Delaware, Le Claire, Anamosa and Bertram stages. Of these the Le Claire is of considerable interest in that the

limestones composing it stand at a high angle, not as a result of folding but because of the conditions of deposition which seem to have been much the same as lead to cross-bedding in sandstones. Below the Le Claire is the reef rock of the Delaware, while above are the fine-grained building stones of the Anamosa. The drift deposits of the county include the Kansan and Iowan drift sheets, certain water-laid interglacial beds, the loess and the alluvium. Jones county is near the drift border and the puzzling anomalies of topography characteristic of that region are well developed.

In Boone county Dr. Beyer treats a region lying wholly within the Coal Measures and wholly within the area covered by the Wisconsin drift. The newness of the topography, which has been developed in post-Wisconsin time is striking. The Des Moines river runs through a deep narrow trench which follows the crest of a preglacial ridge. The appearance of the Gary moraine is well shown in Plate IV and the area covered by it is indicated on the map of the superficial deposits of the county which is the first drift map published by the Iowa Survey.

Warren county also is underlain entirely by the Coal Measures. In several detailed sections across the county Professor J. L. Tilton has illustrated their lithological character and structure. They are covered by the Kansan drift, which is in turn mantled by the loess-silt of southern Iowa. The main rivers of the county are considered to be of preglacial age. North Middle and South rivers are thought to have originally flowed southwest into the Cretaceous sea. They were reversed by the post-Cretaceous earth movements and now drain into the Des Moines, a subsequent stream developed along the strike of soft strata.

In Woodbury county there are exposures of the Cretaceous, including the Dakota and Colorado, certain sand beds called the Riverside sands and which, while of uncertain age, are considered to represent the "latest Pliocene or earliest Pleistocene," the Kansan drift, the loess and the alluvium. The Cretaceous beds have an important historical interest, and the loess is of great thickness and quite characteristically developed. Certain interloessial beds of drift are interpreted as the result of berg ice and considered as indicative of a close relationship between the loess and the Wisconsin ice; a relationship which later studies in adjacent regions do not seem to confirm.

The studies in Washington county are a continuation of those

carried on in Mahaska and Keokuk counties and reported upon in Volume IV. The Coal Measure areas are more limited, the areal development of the Augusta is greater, and the Kinderhook comes in. The latter is described as being made up of the Wassonville limestone, English River gritstone and Maple Mill shale, of which the latter may possibly be at once the upper continuation of the Devonian and the downward extension of the Carboniferous. The close relationship between the two systems is emphasized. The Pleistocene beds include the Kansan drift, loess-silt and the alluvium. The Iowan does not extend into the county and the loess-silt is an extension of the fossiliferous loess of the Iowan drift border.

Appanoose county is of interest in that the Coal Measures show an unusually regular phase of development. The Appanoose beds, as they have been called, include limestone, shales and a coal seam, which maintain their thickness and general character throughout an area of about 1500 square miles in Iowa and Missouri. The conditions of deposition were remarkably uniform and indicate a considerable change from the turbulent and rapidly varying conditions usual in the Des Moines terrane. It has been possible in this county to accurately map the coal-bearing area and a section from Ottumwa southwest indicates the probable presence of lower coal beds, a fact of considerable economic import. The Pleistocene problems are much the same as in Warren and Washington counties and the beds present are the continuations of those described in those counties.

H. F. B.

Monoclinic Pyroxenes of New York State. HEINRICH RIES. (Cont. Min. Dept. Columbia Univ., Vol. VI, No. 6; Annals New York Acad. Sci., Vol. IX, pp. 124-178, pls. XIII-XVI. New York, 1896.)

The pyroxenes of New York occur in the following conditions: (1) as primary constituents of igneous rocks; (2) along the contact zones between the limestones and intrusive rocks; (3) in crystalline limestones in areas of regional metamorphism; (4) associated with iron ore bodies. The present paper includes results of crystallographic, chemical and optical investigations of all the monoclinic pyroxenes of the state, with the exception of Wollastonite. The crystallographic forms found to occur are few in number, but the combinations and the relative development of the faces are in most instances quite character-

istic of the locality. These peculiarities are mentioned under the detailed descriptions of the different localities which follow the more general portion of the paper. Mr. Ries' investigation of the relation between the optical and chemical properties of the pyroxenes, shows that the extinction angle does not increase with the percentage of FeO, thus disagreeing with Wiik's results, although the latter himself found several exceptions to his rule. Comparing the extinction angle with the corresponding sums of the ferrous and ferric iron gives no better results. If, however, the combined percentages of FeO, Fe_2O_3 and Al_2O_3 be taken, a more regular series is obtained. If, furthermore, those containing less than 3 per cent. of Al_2O_3 be excluded from the list as more properly belonging to Diopside, a still better series is obtained, though not even then is the series a perfectly regular one. The results of etching agree very closely with those obtained by Wulff and by Greim. In the chemical investigation Mr. Ries has attempted to calculate in each case the mixture of metasilicates. His analyses indicate that Tschermak's theory of the relation between Al_2O_3 and the oxides of Ca, Mg, and Fe holds good in the case of only about one-half of the New York pyroxenes analyzed. Not the least valuable portion of the paper is a list of the literature bearing on the subject and including some sixty papers.

H. F. B.

Fifteenth Annual Report of the United States Geological Survey, 1893-4.

The administrative portion of the report is followed by five papers of considerable importance. The first is a preliminary report upon the Geology of the Common Roads of the United States, by N. S. Shaler, and includes an outline of the history of American road building, with studies on the value and distribution of road stones, the methods of their use, the effects of geologic structure on the grade of roads, the value of block paving and paving brick and the action of rain and frost upon roads and road material. The paper is a timely contribution to a subject of increasing interest.

The second paper is by L. F. Ward and is upon the Potomac formation. It is the result of detailed studies upon the flora and the stratigraphy of the formation. It is notable in that Mr. Ward divides the formation into six separate series of beds to which local names are given.

A. C. Lawson contributes a sketch of the Geology of the San

Francisco Peninsula, which includes studies of the Franciscan series, the Serpentine, the Tejon sandstone, the Merced series, the Terrace formations and the diastrophic record.

The Marquette iron-bearing district of Michigan is treated in a preliminary report by Van Hise and Bayley, with a chapter upon the Republic trough by H. L. Smyth. The Basement Complex, the Lower Marquette and the Clarksburg formations are treated with considerable detail.

The Origin and Relations of the Central Maryland Granites is treated by C. R. Keyes after an important introductory chapter upon the General Relations of the Granite Rocks in the Middle Atlantic Piedmont Plateau, by the late Professor G. H. Williams.

H. F. B.

Notes Concerning a Peculiarly Marked Sedimentary Rock. By DR. J. E.

TALMAGE, President and Deseret Professor of Geology, University of Utah. Published in pamphlet form, with five plates, reprinted from the *Utah University Quarterly*.

The author describes and illustrates a fine-grained argillaceous sandstone, bearing peculiar surface markings consisting mostly of straight lines intersecting at right angles with almost mathematical precision. The deposit was examined by the writer in place, and an extensive collection of specimens was made under his direction by the "Utah University and Deseret Museum Expedition of 1895." The formation consists of undisturbed sedimentary deposit, referred to Trias or Jura-Trias age, and occupies a relatively low table land between the Kaiparowitz and the Paria plateaus on the north of the Colorado River near Glen Canyon, Arizona. The bed of marked rock is almost two feet thick, and lies conformably between deposits of coarser sandstone, which show none of the rectilinear markings. While the most regular arrangement of the marks appears on slabs with perfectly flat surfaces, yet the rectilinear intersections are plainly shown on warped and ripple-marked surfaces. The lines are so regular as to suggest the possibility of human instrumentality when hand specimens only are examined. The author has performed a number of experiments to test the theory of sun-crack or shrinkage-fissure origin, with negative results; but succeeded in producing marks similar in appearance through the formation of ice-crystals on mud formed from the pulverized stone. Then by pouring on such mud concentrated natural brine from the

Salt Lake, crystals of mirabilite and others of common salt were formed, and these impressed the mud, producing straight lines though without rectilinear intersections. The writer says with reference to this last experiment:

"One would hardly hold, even as a working hypothesis, that lines of 200 or 500 cm. could be produced in any such way; though the supposition may be ventured that under particularly favorable conditions a thin crystalline cake might form on shore sediments, and this by a cleavage of its own might become fissured in an orderly way, the cracks extending to the mud surface beneath, and marking the same superficially; or if the under stratum had a very thin top layer of fine-grained material the depressions might extend through the same. A fresh addition of sediment would fill the cracks and perpetuate the mud marks, while the deposit of soluble mineral might be removed by solution. Shallow line-like depressions in the mud might possibly determine the position of incipient cracks in a subsequent process of slow shrinkage. However, such suppositions lack a stable experimental foundation."

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